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103. Diener, I., "Trajectory nets connecting all critical points of a smooth function," 36 (1986) 340–352.
104. Diener, I., "On the global convergence of path-following methods to determine all solutions to a system of nonlinear equations," 39 (1987) 181–188.
105. Di Pillo, G., L. Grippo, "An exact penalty function method with global convergence properties for nonlinear programming problems," 36 (1986) 1–18.
106. Doup, T.M., G. van der Laan, A.J.J. Talman, "The $(2^{n+1}-2)$-ray algorithm: A new simplicial algorithm to compute economic equlibria," 39 (1987) 241–252.

107. Doup, T.M., A.J.J. Talman, "A new simplicial variable dimension algorithm to find equilibria on the product space of unit simplices," 37 (1987) 319–355.
108. Drezner, Z., "On the complexity of the exchange algorithm for minimax optimization problems," 38 (1987) 219–222.
109. Du, D.-Z., X.-S. Zhang, "A convergence theorem of Rosen's gradient projection method," 36 (1986) 135–144.
110. Du, D.-Z., X.-S. Zhang, "Global convergence of Rosen's gradient projection method," 44 (1989) 357–366.
111. Dupačová, J., "Stability in stochastic programming with recourse. Contaminated distributions," Study 27 (1986) 133–144.
112. Duran, M.A., I.E. Grossmann, "An outer-approximation algorithm for a class of mixed-integer nonlinear programs," 36 (1986) 307–339.
113. Dussault, J.-P., J.A. Ferland, B. Lemaire, "Convex quadratic programming with one constraint and bounded variables," 36 (1986) 90–104.
114. Dyer, M.E., A.M. Frieze, "A randomized algorithm for fixed-dimensional linear programming," 44 (1989) 203–212.
115. Dyer, M.E., A.M. Frieze, C.J.H. McDiarmid, "On linear programs with random costs," 35 (1986) 3–16.

116. Eagambaram, N., S.R. Mohan, "On strongly degenerate complementary cones and solution rays," 44 (1989) 77–83.
Eaves, B.C., *see* M.N. Broadie, 38 (1987) 161–202.
117. Ech-Cherif, A., J.G. Ecker, M. Kupferschmid, "A numerical investigation of rank-two ellipsoid algorithms for nonlinear programming," 43 (1989) 87–95.
Ecker, J.G., *see* A. Ech-Cherif, 43 (1989) 87–95.
Ecker, J.G., *see* M. Kupferschmid, Study 31 (1987) 129–138.
Eckstein, J., *see* D.P. Bertsekas, 42 (1988) 203–243.
118. Eiselt, H.A., "Continuous maximin knapsack problems with GLB constraints," 36 (1986) 114–121.
119. Engquist, M., C.-H. Chen, "Computational comparison of two solution procedures for allocation/processing networks," Study 26 (1986) 218–220.
120. Escudero, L.F., "A motivation for using the truncated Newton approach in a very large scale nonlinear network problem," Study 26 (1986) 240–244.
121. Escudero, L.F., "S3 sets. An extension of the Beale-Tomlin special ordered sets," 42 (1988) 113–123.

122. Fang, S.C., J.R. Rajasekera, "Controlled perturbations for quadratically constrained quadratic programs," 36 (1986) 276–289.
123. Fang, S.C., J.R. Rajasekera, "Quadratically constrained minimum cross-entropy analysis," 44 (1989) 85–96.
124. Fathi, Y., C. Tovey, "Affirmative action algorithms," 34 (1986) 292–301.
Ferland, J.A., *see* J.C. Bernard, 43 (1989) 349–363.
Ferland, J.A., *see* J.-P. Dussault, 36 (1986) 90–104.
125. Ferris, M.C., A.B. Philpott, "An interior point algorithm for semi-infinite linear programming," 43 (1989) 257–276.
126. Fiacco, A.V., J. Kyparisis, "Computable bounds on parametric solutions of convex problems," 40 (1988) 213–221.
Fiacco, A.V., *see* J. Kyparisis, 39 (1987) 285–304.
127. Filar, J.A., T.A. Schultz, "Nonlinear programming and stationary strategies in stochastic games," 34 (1986) 243–247.
128. Fischer, H., K. Ritter, "An asynchronous parallel Newton method," 42 (1988) 363–374.
129. Fischetti, M., S. Martello, "Worst-case analysis of the differencing method for the partition problem," 37 (1987) 117–120.
Fischetti, M., *see* G. Carpaneto, 45 (1989) 233–254.
130. Flám, S.D., "Approximating some convex programs in terms of Borel fields," Study 31 (1987) 73–78.
131. Fleischmann, B., "A new class of cutting planes for the symmetric travelling salesman problem," 40 (1988) 225–246.

132. Fletcher, R., E. Sainz de la Maza, "Nonlinear programming and nonsmooth optimization by successive linear programming," 43 (1989) 235–256.
133. Florian, M., "Nonlinear cost network models in transportation analysis," Study 26 (1986) 167–196.
134. Fourer, R., "A simplex algorithm for piecewise-linear programming II: Finiteness, feasibility and degeneracy," 41 (1988) 281–315.
135. Frank, A., É. Tardos, "Generalized polymatroids and submodular flows," 42 (1988) 489–563.
136. Fredricksen, J.T., L.T. Watson, K.G. Murty, "A finite K-matrices in dimensions less than four," 35 (1986) 17–31.
137. Freund, R.M., "Dual gauge programs, with applications to quadratic programming and the minimum-norm problem," 38 (1987) 47–67.
Frieze, A.M., *see* M.E. Dyer, 35 (1986) 3–16.
Frieze. A.M., *see* M.E. Dyer, 44 (1989) 203–212.
Fuchs, E., *see* K. Marti, Study 28 (1986) 132–156.
138. Fukushima, M., "A relaxed projection method for variational inequalities," 35 (1986) 58–70.
139. Fukushima, M., "A successive quadratic programmming algorithm with global and superlinear convergence properties," 35 (1986) 253–264.
Fukushima, M., *see* S. Hashizume, 37 (1987) 255–267.
140. Fujishige, S., "A capacity-rounding algorithm for the minimum-cost circulation problem: A dual framework of the Tardos algorithm," 35 (1986) 298–308.
141. Fujishige, S., "Optimization over the polyhedron determined by a submodular function on a co-intersecting family," 42 (1988) 565–577.

142. Gaivoronski, A., "Linearization methods for optimization of functionals which depend on probability measures," Study 28 (1986) 157–181.
143. Gal, T., H.-J. Kruse, P. Zörnig, "Survey of solved and open problems in the degeneracy phenomenon," 42 (1988) 125–133.
144. Gallo, G., S. Pallottino, "Shortest path methods: A unifying approach," Study 26 (1986) 38–64.
145. Gallo, G., B. Simeone, "On the supermodular knapsack problem," 45 (1989) 295–309.
146. Gamble, A.B., W.R. Pulleyblank, "Forest covers and a polyhedral intersection theorem," 45 (1989) 49–58.
Gamidov, S. *see* V.F. Demyanov, Study 29 (1986) 74–84.
147. Gan, H., E.L. Johnson, "Four problems on graphs with excluded minors," 45 (1989) 311–330.
148. Gassmann, H., W.T. Ziemba, "A tight upper bound for the expectation of a convex function of a multivariate random variable," Study 27 (1986) 39–53.
149. Gastou, G., E.L. Johnson, "Binary group and Chinese postman polyhedra," 34 (1986) 1–33.
150. Gay, D.M., "A variant of Karmarkar's linear programming algorithm for problems in standard form," 37 (1987) 81–90.
151. Gerards, A.M.H., A. Sebő, "Total dual integrality implies local strong unimodularity," 38 (1987) 69–73.
Gerards, A.M.H., *see* W. Cook, 34 (1986) 251–264.
152. Ghellinck, G. de, J.-Ph. Vial, "An extension of Karmarkar's algorithm for solving a system of linear homogeneous equations on the simplex," 39 (1987) 79–92.
153. Gheysens, F., B. Golden, A. Assad, "A new heuristic for determining fleet size and composition," Study 26 (1986) 233–236.
154. Gilbert, J.C., C. Lemaréchal, "Some numerical experiments with variable-storage quasi-Newton algorithms," 45 (1989) 407–435.
155. Gill, P.E., W. Murray, M.A. Saunders, J.A. Tomlin, M.H. Wright, "On projected Newton barrier methods for linear programming and an equivalence to Karmarkar's projective method," 36 (1986) 183–209.
156. Gill, P.E., W. Murray, M.A. Saunders, M.H. Wright, "A practical anti-cycling procedure for linearly constrained optimization," 45 (1989) 437–474.
157. Glover, F., R. Glover, D. Klingman, "Threshold assignment algorithm," Study 26 (1986) 12–37.
158. Glover, F., D. Klingman, "Layering strategies for creating exploitable structure in linear and integer programs," 40 (1988) 165–181.
Glover, F., *see* C. Brezovec, 36 (1986) 39–53.
Glover, F., *see* C. Brezovec, 42 (1988) 471–487.

Glover, R., *see* F. Glover, Study 26 (1986) 12–37.
Golden, B., *see* F. Gheysens, Study 26 (1986) 233–236.
159. Goldfarb, D., S. Mehrotra, "Relaxed variants of Karmarkar's algorithm for linear programs with unknown optimal objective value," 40 (1988) 183–195.
160. Goldfarb. D., S. Mehrotra, "A relaxed version of Karmarkar's method," 40 (1988) 289–315.
161. Gollan, B., "Eigenvalue perturbations and nonlinear parametric optimization," Study 30 (1987) 67–81.
162. Gonzaga, C.C., "Conical projection algorithms for linear programming," 43 (1989) 151–173.
163. Gorokhovik, V.V., "ε-Quasidifferentiability of real-valued functions and optimality conditions in extremal problems," Study 29 (1986) 203–218.
164. Gould, N.I.M., J.K. Reid, "New crash procedures for large systems of linear constraints," 45 (1989) 475–501.
Gould, N.I.M., *see* A.R. Conn, 37 (1987) 19–40.
165. Grandinetti, L., D. Conforti, "Numerical comparisons of nonlinear programming algorithms on serial and vector processors using automatic differentiation," 42 (1988) 375–389.
166. Granot, D., "A generalized linear production model: A unifying model," 34 (1986) 212–222.
167. Green, P.J., "Regression, curvature and weighted least squares," 42 (1988) 41–51.
168. Greenberg, H.J., "Computer-assisted analysis for diagnosing infeasible or unbounded linear programs," Study 31 (1987) 79–97.
Green-Krotki, J., *see* W.H. Cunningham, 36 (1986) 228–237.
169. Grigoriadis, M.D., "An efficient implementation of the network simplex method," Study 26 (1986) 83–111.
Grippo, L., *see* G. Di Pillo, 36 (1986) 1–18.
Grossman, I.E., *see* M.A. Duran, 36 (1986) 307–339.
170. Grötschel, M., Y. Wakabayashi, "A cutting plane algorithm for a clustering problem," 45 (1989) 59–96.
171. Grzegórski, S.M., "Multilevel least-change Newton-like methods for equality constrained optimization problems," 37 (1987) 91–116.
172. Güder, F., "Pairwise reactive SOR algorithm for quadratic programming of net import spatial equilibrium models," 43 (1989) 175–186.
173. Guélat, J., P. Marcotte, "Some comments on Wolfe's away step'," 35 (1986) 110–119.
174. Guignard, M., S. Kim, "Lagrangean decomposition: A model yielding stronger Lagrangean bounds," 39 (1987) 215–228.

175. Hackbarth, K.-D., "A heuristic procedure for calculating telecommunication transmission networks in consideration of network reliability," Study 26 (1986) 213–214.
176. Haddad, G., "The role of tangent and normal cones in the viability theory of differential inclusions," Study 30 (1987) 34–44.
177. Han, S.-P., "A successive projection method," 40 (1988) 1–14.
Han, S.-P., *see* J.V. Burke, 43 (1989) 277–303.
178. Hansen, P., B. Jaumard, M. Minoux, "A linear expected-time algorithm for deriving all logical conclusions implied by a set of Boolean inequalities," 34 (1986) 223–231.
179. Hanson, M.A., B. Mond, "Necessary and sufficient conditions in constrained optimization," 37 (1987) 51–58.
180. Harker, P.T., "Accelerating the convergence of the diagonalization and projection algorithms for finite-dimensional variational inequalities," 41 (1988) 29–59.
181. Hashizume, S., M. Fukushima, N. Katoh, T. Ibaraki, 'Approximation algorithms for combinatorial fractional programming problems," 37 (1987) 255–267.
182. Hattersley, B., J. Wilson, "A dual approach to primal degeneracy," 42 (1988) 135–145.
183. Haurie, A., P. Marcotte, "A game-theoretic approach to network equilibrium," Study 26 (1986) 252–255.
184. Hearn, D.W., S. Lawphongpanich, J.A. Ventura, 'Restricted simplicial decomposition: Computation and extensions," Study 31 (1987) 99–118.
Helgason, R., *see* E. Allen, 37 (1987) 309–317.
185. Herskovits, J., "A two-stage feasible directions algorithm for nonlinear constrained optimization," 36 (1986) 19–38.

186. Hettich, R., "An implementation of a discretization method for semi-infinite programming," 34 (1986) 354–361.
Hettich, R., *see* P. Zencke, 38 (1987) 323–340.
187. Ho, J.K., "Recent advances in the decomposition approach to linear programming," Study 31 (1987) 119–127.
188. Ho, J.K., R.C. Lee, R.P. Sundarraj, "Decomposition of linear programs using parallel computation," 42 (1988) 391–405.
189. Hoffman, A.J., "On greedy algorithms for series parallel graphs," 40 (1988) 197–204.
Hopp, W.J., *see* P.C. Jones, 41 (1988) 357–366.
Horst, R., *see* H. Tuy, 41 (1988) 161–183.
Hulbert, L.A., *see* T.F. Coleman, 45 (1989) 373–406.

Ibaraki, T., *see* S. Hashizume, 37 (1987) 255–267.
190. Imai, H., "On the convexity of the multiplicative version of Karmarkar's potential function," 40 (1988) 29–32.

191. Jackson, P.L., D.F. Lynch, "Revised Dantzig–Wolfe decomposition for staircase-structured linear programs," 39 (1987) 157–179.
192. Jackson, R.H.F., G.P. McCormick, "Second-order sensitivity analysis in factorable programming: Theory and applications," 41 (1988) 1–27.
193. Jansen, M.J.M., S.H. Tijs, "Robustness and nondegenerateness for linear complementarity problems," 37 (1987) 293–308.
Jaumard, B., *see* P. Hansen, 34 (1986) 223–231.
Jensen, D.L., *see* S. Chopra, 43 (1989) 1–29.
194. Jeter, M.W., W.C. Pye, "An example of a nonregular semimonotone D-matrix," 44 (1989) 351–356.
195. Johnson, E.L., P. Pieroni, "A linear programming approach to the optimum network orientation problem," Study 26 (1986) 215–217.
Johnson, E.L., *see* S. Chopra, 38 (1987) 229–270.
Johnson, E.L., *see* S. Chopra, 43 (1989) 1–29.
Johnson, E.L., *see* H. Gan, 45 (1989) 311–330.
Johnson, E.L., *see* G. Gastou, 34 (1986) 1–33.
196. Jones, P.C., "Even more with the Lemke complementarity algorithm," 34 (1986) 239–242.
197. Jones, P.C., J.L. Zydiak, W.J. Hopp, "Stationary dual prices and depreciation," 41 (1988) 357–366.
198. Jongen, H.Th., P. Jonker, F. Twilt, "Critical sets in parametric optimization" 34 (1986) 333–353.
Jonker, P., *see* H.Th. Jongen, 34 (1986) 333–353.
Jünger, M., *see* F. Barahona, 44 (1989) 127–137.

Kabadi, S.N., *see* K.G. Murty, 39 (1987) 117–129.
Karmarkar, N., *see* I. Adler, 44 (1989) 297–335.
Karwan, M.H., *see* B. Ram, 43 (1989) 103–106.
Katoh, N., *see* S. Hashizume, 37 (1987) 255–267.
199. Kawasaki, H., "An envelope-like effect of infinitely many inequality constraints on second-order necessary conditions for minimization problems," 41 (1988) 73–96.
200. Kawasaki, H., "The upper and lower second order directional derivatives of a sup-type function," 41 (1988) 327–339.
201. Kennedy, D., "Some branch and bound techniques for nonlinear optimization," 42 (1988) 147–157.
Kennington, J., *see* E. Allen, 37 (1987) 309–317.
202. Kern, W., "A probabilistic analysis of the switching algorithm for the Euclidean TSP," 44 (1989) 213–219.
Kim, S., *see* M. Guignard, 39 (1987) 215–338.
203. Kiwiel, K.C., "A linearization method for minimizing certain quasidifferentiable functions," Study 29 (1986) 85–94.
204. Kiwiel, K.C., "A method of linearizations for linearly constrained nonconvex nonsmooth minimization," 34 (1986) 175–187.
205. Klein Haneveld, W.K., "Robustness against dependence in PERT: An application of duality and distributions with known marginals," Study 27 (1986) 153–182.

206. Kleinschmidt, P., C.W. Lee, H. Schannath, 'Transportation problems which can be solved by the use of Hirsch-paths for the dual problems," 37 (1987) 153–168.
Klingman, D., *see* F. Glover, Study 26 (1986) 12–37.
Klingman, D., *see* F. Glover, 40 (1988) 165–181.
207. Kojima, M., S. Mizuno, T. Noma, "A new continuation method for complementarity problems with uniform *P*-functions," 43 (1989) 107–113.
208. Kojima, M., S. Mizuno, A. Yoshise, "A polynomial-time algorithm for a class of linear complementarity problems," 44 (1989) 1–26.
Kojima, M., *see* Y. Ye, 39 (1987) 305–317.
209. Komáromi, É., "A dual method for probabilistic constrained problems," Study 28 (1986) 94–112.
210. Konno, H., "Minimum concave cost production system: A further generalization of multi-echelon model," 41 (1988) 185–193.
Kruse, H.-J., *see* T. Gal, 42 (1988) 125–133.
211. Kupferschmid, M., J.G. Ecker, "A note on solution of nonlinear programming problems with imprecise function and gradient values," Study 31 (1987) 129–138.
Kupferschmid, M., *see* A. Ech-Cherif, 43 (1989) 87–95.
212. Kyparisis, J., "Uniqueness and differentiability of solutions of parametric nonlinear complementarity problems," 36 (1986) 105–113.
213. Kyparisis, J., "Sensitivity analysis framework for variational inequalities," 38 (1987) 203–213.
214. Kyparisis, J., A.V. Fiacco, "Generalized convexity and concavity of the optimal value function in nonlinear programming," 39 (1987) 285–304.
Kyparisis, J., *see* A.V. Fiacco, 40 (1988) 213–221.

215. Laan, G. van der, A.J.J. Talman, "Simplicial approximation of solutions to the nonlinear complementarity problem with lower and upper bounds," 38 (1987) 1–15.
Laan, G. van der, *see* T.M. Doup, 39 (1987) 241–252.
216. Lamond, B.F., "A generalized inverse method for asymptotic linear programming," 43 (1989) 71–86.
217. Lasdon, L.S., J. Plummer, "Optimal design of efficient acoustic antenna arrays," 39 (1987) 131–155.
218. Laurent, M., "A generalization of antiwebs to independence systems and their canonical facets," 45 (1989) 97–108.
Laurent, M., *see* M. Conforti, 45 (1989) 255–277.
Lawphongpanich, S., *see* D.W. Hearn, Study 31 (1987) 99–118.
219. Lazimy, R., "Solving multiple criteria problems by interactive decomposition," 35 (1986) 334–361.
Lee, C.W., *see* P. Kleinschmidt, 37 (1987) 153–168.
Lee, T.C., *see* J.K. Ho, 42 (1988) 391–405.
Lefebvre, O., *see* C. Michelot, 39 (1987) 319–335.
Lemaire, B., *see* J.-P. Dussault, 36 (1986) 90–104.
Lemaréchal, C., *see* J.C. Gilbert, 45 (1989) 407–435.
220. Leung, J.M.Y., T.L. Magnanti, "Valid inequalities and facets of the capacitated plant location problem," 44 (1989) 271–291.
221. Leung, J.M.Y., T.L. Magnanti, R. Vachani, "Facets and algorithms for capacitated lot sizing," 45 (1989) 331–359.
Lewis, A.S., *see* E.J. Anderson, 44 (1989) 247–269.
222. Li, G., "Successive column correction algorithms for solving sparse nonlinear systems of equations," 43 (1989) 187–207.
Liebling, Th.M., *see* M.L. Balinski, 35 (1986) 362–364.
Lindberg, P.O., *see* J.-P. Crouzeix, 35 (1986) 42–57.
223. Liu, D.C., J. Nocedal, "On the limited memory BFGS method for large scale optimization," 45 (1989) 503–528.
224. Louveaux, F.V., "Multistage stochastic programs with block-separable recourse," Study 28 (1986) 48–62.
225. Lu, S.H., A.C. Williams, "Roof duality for polynomial 0–1 optimization," 37 (1987) 357–360.
226. Lucertini, M., G. Paletta, "A class of network design problems with multiple demand: Model formulation and an algorithmic approach," Study 26 (1986) 225–228.
227. Lundy, M., A. Mees, "Convergence of an annealing algorithm," 34 (1986) 111–124.
Lynch, D.F., *see* P.L. Jackson, 39 (1987) 157–179.

228. Maany, Z.A., "A new algorithm for highly curved constrained optimisation," Study 31 (1987) 139-154.
Maffioli, F., *see* P.M. Camerini, Study 26 (1986) 229-232.
Maffioli, F., *see* P.M. Camerini, 45 (1989) 211-231.
229. Magnanti, T.L., P. Mireault, R.T. Wong, "Tailoring Benders decomposition for uncapacitated network design," Study 26 (1986) 112-154.
230. Magnanti, T.L., J.B. Orlin, "Parametric linear programming and anti-cycling pivoting rules," 41 (1988) 317-325.
Magnanti, T.L., *see* J.M.Y. Leung, 44 (1989) 271-291.
Magnanti, T.L., *see* J.M.Y. Leung, 45 (1989) 331-359.
231. Mahjoub, A.R., "On the stable set polytope of a series-parallel graph," 40 (1988) 53-57.
Mahjoub, A.R., *see* F. Barahona, 36 (1986) 157-173.
Mahjoub, A.R., *see* F. Barahona, 45 (1989) 21-33.
232. Mangasarian, O.L., T.-H. Shiau, "Error bounds for monotone linear complementarity problems," 36 (1986) 81-89.
Mangasarian, O.L., *see* R. De Leone, 42 (1988) 347-361.
Marcotte, O.M.-C., *see* R.E. Bixby, 39 (1987) 231-239.
233. Marcotte, P., "Network design problem with congestion effects: A case of bilevel programming," 34 (1986) 142-162.
Marcotte, P., *see* J. Guélat, 35 (1986) 110-119.
Marcotte, P., *see* A. Haurie, Study 26, 1986) 252-255.
Martello, S., *see* M. Fischetti, 37 (1987) 117-120.
234. Marti, K., E. Fuchs, "Computation of descent directions and efficient points in stochastic optimization problems without using derivatives," Study 28 (1986) 132-156.
235. Mathiesen, L., "An algorithm based on a sequence of linear complementarity problems applied to a Walrasian equilibrium model: An example," 37 (1937) 1-18.
McAllister, P.H., *see* G.B. Dantzig, 42 (1988) 11-32.
McCormick, G.P., *see* R.H.F. Jackson, 41 (1988) 1-27.
236. McDiarmid, C., "On the greedy algorithm with random costs," 36 (1986) 245-255.
McDiarmid, C.J.H., *see* M.E. Dyer, 35 (1986) 3-16.
McDonald, J.F., *see* R.J. Caron, 43 (1989) 97-102.
Mees, A., *see* M. Lundy, 34 (1986) 111-124.
237. Megiddo, N., "Improved asymptotic analysis of the average number of steps performed by the self-dual simplex algorithm," 35 (1986) 140-172.
238. Megiddo, N., "On the expected number of linear complementarity cones intersected by random and semi-random rays," 35 (1986) 225-235.
239. Megiddo, N., "A note on degeneracy in linear programming," 35 (1986) 365-367.
Mehrotra, S., *see* D. Goldfarb, 40 (1988) 183-195.
Mehrotra, S., *see* D. Goldfarb, 40 (1988) 289-315.
240. Melzer, D., "On the expressibility of piecewise-linear continuous functions as the difference of two piecewise-linear convex functions," Study 29 (1986) 118-134.
241. Meyer, G.G.L., "Convergence of relaxation algorithms by averaging," 40 (1988) 205-212.
Meyer, R.R., *see* R.J. Chen, 42 (1988) 327-345.
242. Michelot, C., O. Lefebvre, "A primal-dual algorithm for the Fermat-Weber problem involving mixed gauges," 39 (1987) 319-335.
243. Mifflin, R., "An implementation of an algorithm for univariate minimization and an application to nested optimization," Study 31 (1987) 155-166.
244. Mifflin, R., J.-J. Strodiot, "A bracketing technique to ensure desirable convergence in univariate minimization," 43 (1989) 117-130.
245. Minoux, M., "Solving integer minimum cost flows with separable convex cost objective polynomially," Study 26 (1986) 237-239.
246. Minoux, M., "Solving combinatorial problems with combined min-max-sum objective and applications," 45 (1989) 361-372.
Minoux, M., *see* P. Hansen, 34 (1986) 223-231.
Mireault, P., *see* T.L. Magnanti, Study 26 (1986) 112-154.
Mizuno, S., *see* M. Kojima, 43 (1989) 107-113.

Mizuno, S., *see* M. Kojima, 44 (1989) 1-26.
247. Mladineo, R.H., "An algorithm for finding the global maximum of a multimodal, multivariate function," 34 (1986) 188-200.
Mohan, S.R., *see* N. Eagambaram, 44 (1989) 77-83.
Mond, B., *see* M.A. Hanson, 37 (1987) 51-58.
248. Monteiro, R.D.C., I. Adler, "Interior path following primal-dual algorithms. Part I: Linear Programming," 44 (1989) 27-41.
249. Monteiro, R.D.C., I. Adler, "Interior path following primal-dual algorithms. Part II: Convex quadratic programming," 44 (1989) 43-66.
250. Moore, R.E., H. Ratschek, "Inclusion functions and global optimization II," 41 (1988) 341-356.
Moré, J.J., *see* P.H. Calamai, 39 (1987) 93-116.
Morshedi, A.M., *see* J.E. Dennis, Jr., 39 (1987) 1-20.
Mota, E., *see* N. Christofides, Study 26 (1986) 155-166.
Mulvey, J.M., *see* S.A. Zenios, 42 (1988) 449-470.
Murray, W., *see* P.E. Gill, 36 (1986) 183-209.
Murray, W., *see* P.E. Gill, 45 (1989) 437-474.
251. Murty, K.G., S.N. Kabadi, "Some NP-complete problems in quadratic and nonlinear programming," 39 (1987) 117-129.
Murty, K.G., *see* J.T. Fredricksen, 35 (1986) 17-31.

252. Naddef, D., "The Hirsch conjecture is true for (0, 1)-polytopes," 45 (1989) 109-110.
253. Nash, S.G., A. Sofer, "Block truncated-Newton methods for parallel optimization," 45 (1989) 529-546.
254. Nazareth, J.L., "The method of successive affine reduction for nonlinear minimization," 35 (1986) 97-109.
255. Nazareth, J.L., R.J.-B. Wets, "Algorithms for stochastic programs: The case of nonstochastic tenders," Study 28 (1986) 1-28.
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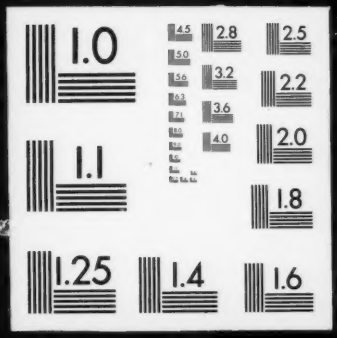
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